



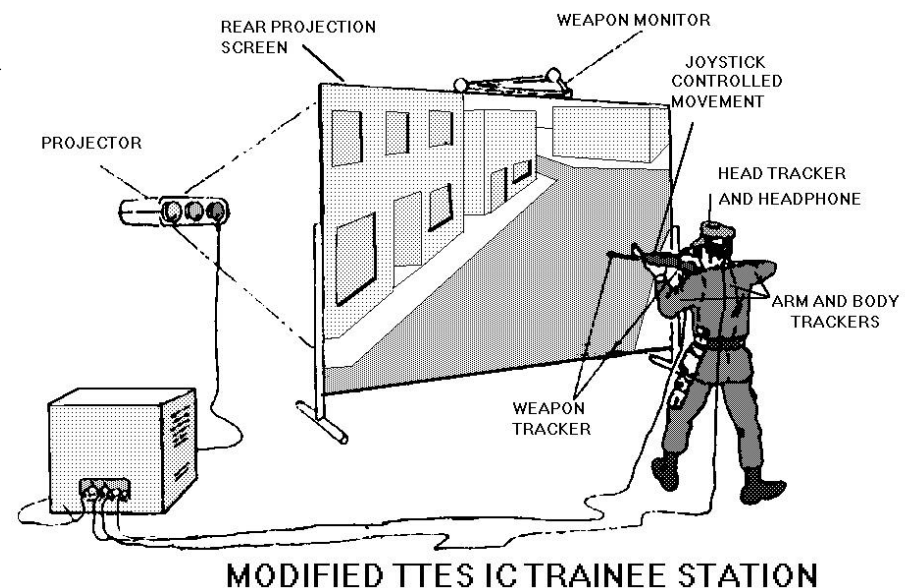
Computer Controlled Hostiles for TTES

Douglas Reece

Institute for Simulation and Training
University of Central Florida

Team Target Engagement Simulator

- IC project funded by USMC, performed by NAWCTSD
- Rifle squads
- MOUT--Quantico CTV
- DIS
- CC hostiles and neutrals

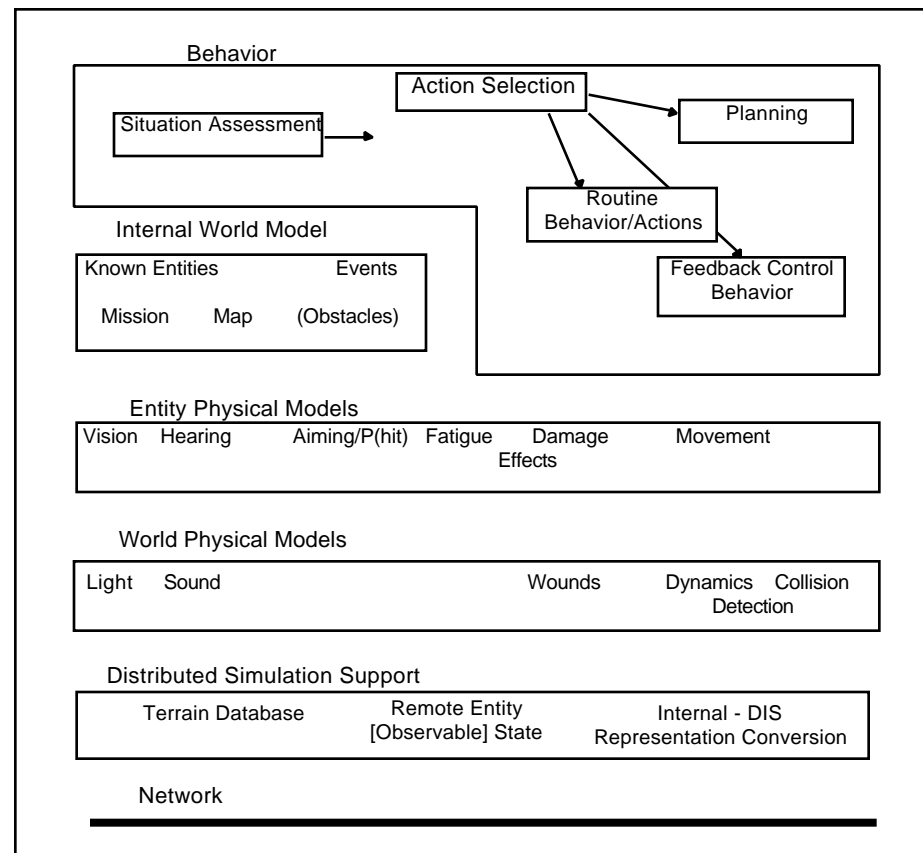


Voice and Gesture Control of CGF

- Small project funded by ARI
- About a dozen arm signals, words to form about a dozen sentences
- Control of helicopter landing
- Control of fireteam
 - formation movement
 - coordinated movement and fire

Computer Controlled ICs

- Models for all levels of human characteristics from behavior down to physical model
- Simulation support including DIS representation, urban terrain database



Simulation Requirements

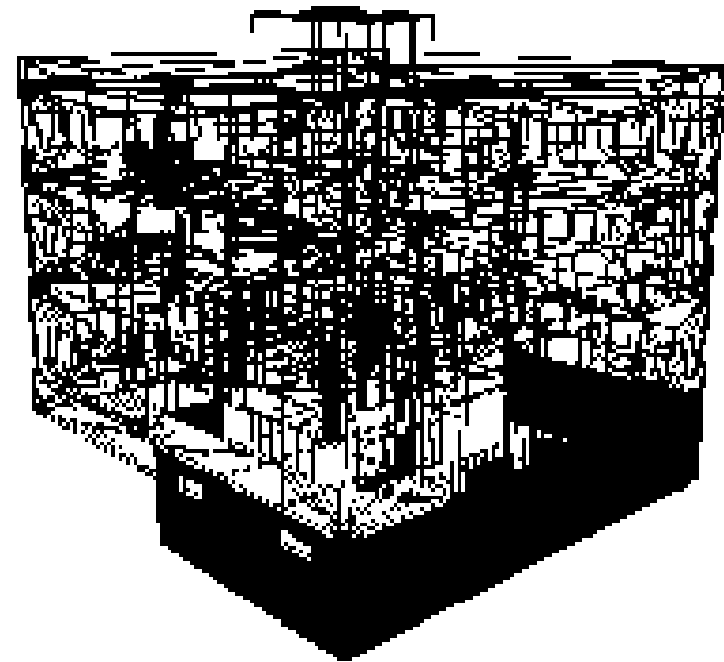
- Approx. 2 yrs, PC platforms, 2-3 staff
- Match capabilities of trainee platform
 - DIS representation
 - State transition times
 - Movement
 - Detection
 - Weapon use
 - Damage

Battlefield Environment

- Ground polygons to < 1 foot (e.g. curbs)
- Other terrain limited to trees, treelines, roads
- No dynamic terrain (yet) or weather

Battlefield Environment

- 3D buildings
 - Polygons to 8 inches (cinderblocks)
 - Free movement inside, on multiple levels
 - Rubbled buildings



Mission

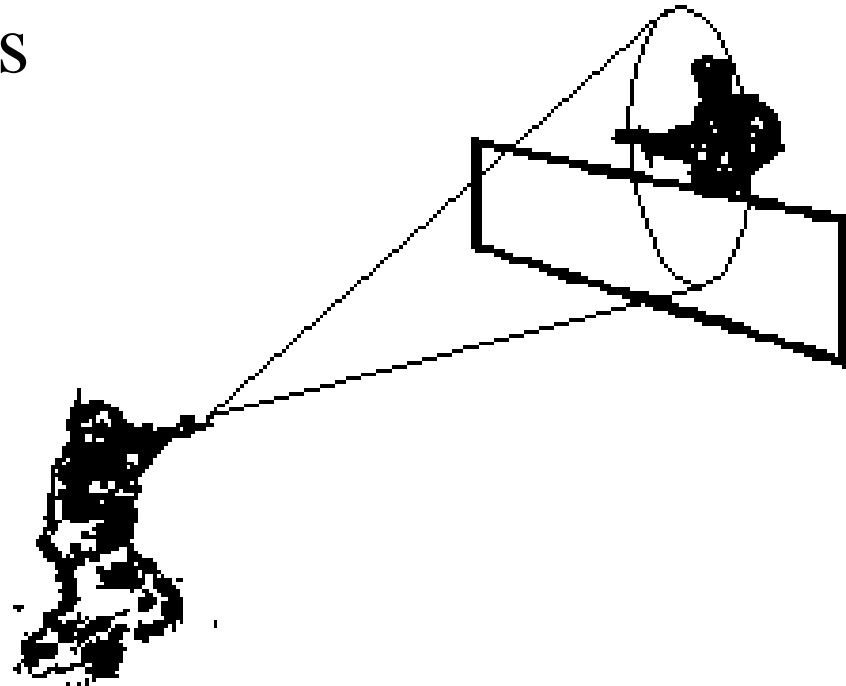
- Meeting engagements, BLUEFOR clearing ops in urban terrain. Neutral entities.
- Primarily individual-level tasks; limited (so far) team actions
- No “unit” tasks; all coordinated action stems from individual behavior, roles.
- Casualty evacuation behavior could be added... requires DIS representation for carrying entities, etc.

Soldier state: Physical model

- DIS states--speed, facing, stance, weapon
 - Movement capabilities--rates, translation mode
 - States put constraints on actions
- Fatigue: energy level
- Wounds: not modeled yet (need display?)

Soldier state: Physical model

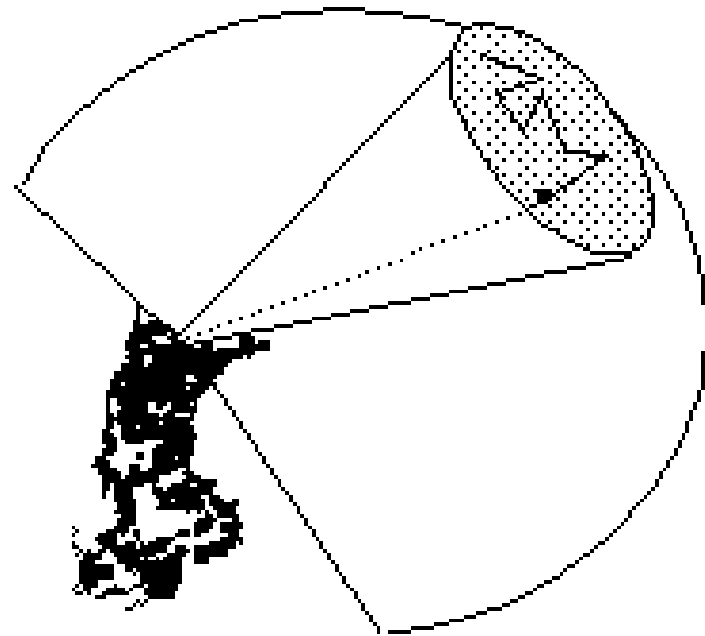
- Weapon use: $P(\text{hit})$
based on error radius
 - Visible target area:
aspect, parts visible
 - Weapon accuracy,
target & observer
motion,...



Soldier state: Situation awareness

Visual detection

- Two fields of view
 - “Pop up” detection
 - Visual search for ID
- Visible size of target
 - Aspect, visible parts
- Target motion



Soldier state: Situation awareness

- Audio Detection
 - Sounds from footsteps, weapons (& engines)
 - Masking of soft sounds
- Uncertainty
 - Visible, detected, recognized, identified
 - Peripheral vision, footsteps: recognition
 - Foveal vision, weapon fire: identification

Soldier state: Situation awareness

- Entity visible-- “real”
- Entity acquired but out of sight-- “figment”
 - Last known state remembered
 - Figment still used in tactical reasoning
- Figment’s last location visible, but figment entity is not-- “ghost”

Behavior: Communication

- Gestures and spoken words put in ES PDU
 - Gesture interpretation at sender
 - Sentence parsing at receiver
- Gestures and words observable by others
- Gestures and words used as input to behavior--do not directly trigger action

Behavior: Entity types

- Different soldier types (training level,...)
 - Treated as different DIS entity types
 - Different physical parameters, behavioral response probabilities
- Neutrals
 - Completely different behavior
- Other types (gender) could at least be distinguished this way

Behavior: Action selection

- Threats, friendlies, neutrals, terrain, mission, and commands all bear on next action
- CCHs currently make only short term plans
 - Plan route
 - Engage figment: move to firing position, pursue
- Fast (bounded) selection
 - Long computations performed in background

Behavior: Action selection

- Simple rules select action to accomplish task
- Action may be subtask--> recursive action selection for decomposed tasks
- Probabilistic selection among candidate actions
 - To implement soldier types
 - Persistence avoids dithering

Behavior

- Fully autonomous
 - Necessary at IC level
- Simulation structural events (e.g. PDU arrival) themselves do not cause action--only selection

Misc Design Issues

- Doctrinal behavior only as far as SME report on behavior responses.
- General intelligent agent, with some human characteristics modeled
- Architecture of all forces is the same

Other Issues

- No VV&A other than “playing” the system
- Essentially no empirical data at this level
- Technical issues to address:
 - Empirical data for physical models and response behaviors
 - Physical model definition
 - Terrain modeling, terrain reasoning
 - Situation assessment
 - Pursuing multiple goals that may conflict
 - DIS representation
 - User interface